

Claims

5

- 10 1. System for providing a common time base between different locations on earth, comprising:

a spacecraft carrying a component of a communication channel, wherein the position of said spacecraft is known,

15

a plurality of receiving stations at different locations on earth, wherein each receiving station is adapted to receive a reference signal from said component;

20

synchronisation means adapted to provide a synchronised time base between the plurality of receiving stations; and

25

correction means adapted to correct the synchronization error of the synchronized time base by the known position of the spacecraft and in accordance with the propagation time of each received reference signal.

30

2. System according to claim 1, wherein at least one receiving station comprises a correlation receiver yielding a correlation gain for receiving the reference signal.

35

3. System according to claim 2, wherein the correlation receiver is based on the correlation of a predetermined signal pattern contained in the reference signal.

5

4. System according to claim 2, wherein the correlation receiver is based on the spread spectrum demodulation of a spread spectrum signal.

10 5. System according to claim 4, wherein the spread spectrum demodulation yields a processing gain which corresponds to the correlation gain.

15 6. Method for providing a common time base between different locations on earth with the aid of a spacecraft carrying a component of a communication channel, wherein the position of said spacecraft is known, comprising the steps of:

20 receiving a reference signal from said component by a plurality of receiving stations at different locations on earth;

25 providing a synchronised time base between the plurality of receiving stations; and

30 correcting the synchronization error of the synchronized time base by the known position of the spacecraft and in accordance with the propagation time of each received reference signal.

35 7. Method according to claim 6, wherein for at least one receiving station a correlation method yielding a correlation gain for receiving the first reference signal and/or the second reference signal is applied.

8. Method according to claim 7, wherein the correlation method is based on the correlation of a predetermined signal pattern contained in the first reference signal and/or the second reference signal.
9. Method according to claim 7, wherein the correlation method is based on the spread spectrum demodulation of a spread spectrum signal.
10. Method according to claim 9, wherein the spread spectrum demodulation yields a processing gain which corresponds to the correlation gain.
11. Processing station for providing a common time base between different locations on earth with the aid of a spacecraft carrying a component of a communication channel, wherein the position of said spacecraft is known, comprising:
- propagation time data receiving means adapted to receive propagation time data from a plurality of receiving stations at different locations on earth, wherein each receiving station is adapted to receive a reference signal from said component and wherein a synchronised time base is provided between the plurality of receiving stations, and
- correction means adapted to correct the synchronization error of the synchronized time base by the known position of the spacecraft and in accordance with the propagation time of each received reference signal.

12. Processing method for providing a common time base between different locations on earth with the aid of a spacecraft carrying a component of a communication channel, wherein the position of said spacecraft is known, comprising the steps of:

receiving propagation time data from a plurality of receiving stations at different locations on earth, wherein each receiving station is adapted to receive a reference signal from said component and wherein a synchronised time base is provided between the plurality of receiving stations, and

correcting the synchronization error of the synchronised time base by the known position of the spacecraft and in accordance with the propagation time of each received reference signal.

13. Ranging system for determining ranging information of a first spacecraft (Sat 2A) with the aid of a second spacecraft (Sat 1A) whose ranging information is known, wherein the first spacecraft (Sat 2A) carries a first component of a communication channel and wherein the second spacecraft (Sat 1A) carries a second component of a communication channel, comprising:

a plurality of receiving stations at different locations on earth, wherein each receiving station is adapted to receive a first reference signal from the first component and a second reference signal from the second component;

synchronisation means adapted to provide a synchronised time base between the plurality of receiving stations;

- calculation means adapted to calculate said ranging information in accordance with the propagation time of each first reference signal, wherein the
- 5 synchronisation error of the synchronised time base is corrected by the known ranging information of the second spacecraft (Sat 1A) on the basis of each second reference signal.
- 10 14. Ranging system according to claim 13, wherein at least one receiving station comprises a correlation receiver yielding a correlation gain for receiving the first reference signal and/or the second reference signal.
- 15 15. Ranging system according to claim 14, wherein the correlation receiver is based on the correlation of a predetermined signal pattern contained in the first reference signal and/or the second reference signal.
- 20 16. Ranging system according to claim 14, wherein the correlation receiver is based on the spread spectrum demodulation of a spread spectrum signal.
- 25 17. Ranging system according to claim 16, wherein the spread spectrum demodulation yields a processing gain which corresponds to the correlation gain.
- 30 18. Ranging method for determining ranging information of a first spacecraft (Sat 2A) with the aid of a second spacecraft (Sat 1A) whose ranging information is known, wherein the first spacecraft (Sat 2A) carries a first component of a communication channel and wherein the second spacecraft (Sat 1A) carries a second component of a communication channel, comprising the
- 35 steps of:

receiving a first reference signal from said first
component and a second reference signal from said
second component independently by a plurality of
5 receiving stations at different locations on earth;

providing a synchronised time base between the
plurality of receiving stations;

10 calculating said ranging information in accordance
with the propagation time of each first reference
signal, wherein the synchronisation error of the
synchronised time base is corrected by the known
ranging information of the second spacecraft (Sat 1A)
15 on the basis of each second reference signal.

19. Method according to claim 18, wherein for at least one
receiving station a correlation method yielding a
correlation gain for receiving the first reference
20 signal and/or the second reference signal is applied.

20. Method according to claim 19, wherein the correlation
method is based on the correlation of a predetermined
signal pattern contained in the first reference signal
25 and/or the second reference signal.

21. Method according to claim 19, wherein the correlation
method is based on the spread spectrum demodulation of
a spread spectrum signal.

30 22. Method according to claim 21, wherein the spread
spectrum demodulation yields a processing gain which
corresponds to the correlation gain.

23. Receiving station for providing ranging information of a first spacecraft (Sat 2A) with the aid of a second spacecraft (Sat 1A) whose ranging information is known, wherein the first spacecraft (Sat 2A) carries a first component of a communication channel and wherein the second spacecraft (Sat 1A) carries a second component of a communication channel, comprising:

an antenna adapted to receive a first reference signal from said first component and a second reference signal from said second component;

synchronisation means adapted to provide a synchronised time base between said receiving station and a reference point on earth, wherein the synchronisation error of the synchronised time base is corrected by the known ranging information of the second spacecraft (Sat 1A) on the basis of the second reference signal; and

measurement means adapted to measure the propagation time of the first reference signal in accordance with the corrected synchronized time base.

24. Method for operating a receiving station for providing ranging information of a first spacecraft (Sat 2A) with the aid of a second spacecraft (Sat 1A) whose ranging information is known, wherein the first spacecraft (Sat 2A) carries a first component of a communication channel and wherein the second spacecraft (Sat 1A) carries a second component of a communication channel, comprising the steps of:

receiving a first reference signal from said first component and a second reference signal from said second component;

5 providing a synchronised time base between said receiving station and a reference point on earth, wherein the synchronisation error of the synchronised time base is corrected by the known ranging information of the second spacecraft (Sat 1A) on the basis of the second reference signal; and

10

measuring the propagation time of the first reference signal in accordance with the corrected synchronised time base.

15

25. Processing station for processing ranging information of a first spacecraft (Sat 2A) with the aid of a second spacecraft (Sat 1A) whose ranging information is known, wherein the first spacecraft (Sat 2A) carries a first component of a communication channel and wherein the second spacecraft (Sat 1A) carries a second component of a communication channel, comprising:

20

25

propagation time data receiving means adapted to receive propagation time data from a plurality of receiving stations at different locations on earth;

30

wherein each receiving station is adapted to receive a first reference signal from the first component and a second reference signal from the second component, wherein a synchronised time base is provided between the plurality of receiving stations, and wherein the synchronisation error of the synchronised time base is corrected by the known ranging information of the

35

second spacecraft (Sat 1A) on the basis of each second reference signal.

- 5 26. Processing method for processing ranging information of a first spacecraft (Sat 2A) with the aid of a second spacecraft (Sat 1A) whose ranging information is known, wherein the first spacecraft (Sat 2A) carries a first component of a communication channel and wherein the second spacecraft (Sat 1A) carries a
10 second component of a communication channel, comprising the steps of:

receiving propagation time data from a plurality of receiving stations at different locations on earth;

15

wherein each receiving station is adapted to receive a first reference signal from the first component and a second reference signal from the second component, wherein a synchronised time base is provided between
20 the plurality of receiving stations, and wherein the synchronisation error of the synchronised time base is corrected by the known ranging information of the second spacecraft (Sat 1A) on the basis of each second reference signal.

25